

REMARKS

Claims 1-53 are pending in this application. Claims 19-44 were withdrawn in response to a restriction requirement wherein the Applicant elected Claims 1-18 and 45-53. Applicant reserves the right to file continuing applications directed to the non-elected claims, Claims 19-44.

Objection to the Drawings and Specification

In paragraph 3 of the pending Office Action the Examiner objected to Figures 1-4a, 17, 18, 19, and 28-31 stating that these Figures should be designated by a legend as "Prior Art." Applicant has amended the Figures by adding a legend of "Prior Art" to each of the identified Figures. Replacement drawings identified with "Replacement Sheet" in the top margin are presented in "Replacement Drawing Sheets" accompanying this request for reconsideration.

In paragraph 4 of the pending Office Action the Examiner objected to several of the Figures in the Application stating that they did not comply with 37 CFR § 1.84(p)(5) because the Figures include reference characters not mentioned in the written description. Replacement drawings identified with "Replacement Sheet" in the top margin are attached to the "Replacement Drawing Sheets" accompanying this request for reconsideration, with these changes:

Figure 44 has been amended removing the reference character --4'-- and its associated bracket;

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Figure 35 has been amended removing the reference character --3502-- and changing reference characters --35A -- to --Figure 35A-- and --35B-- to -- Figure 35B --.

Figure 34A has not been amended. Applicant would like to draw the Examiner's attention to page 32 line 1 through page 33 line 3 in the specification where the reference characters are mentioned in the discussion of Figure 34A.

Figure 21 has been amended removing the reference character --2104--. The specification has been amended at page 6 line 14 changing --2100-- to -- 2106--. This amendment is included in Amendments to the Specification section above.

Figure 24 has been amended removing reference character --2402--.

Figure 25 has been amended replacing --26-- with --Figure 26--.

Figure 26 has been amended replacing --27-- with --Figure 27--.

Figure 32 has been amended replacing --33-- with --Figure 33-- and replacing --33A-- with --Figure 33A--.

Figures 44 and 45 have been separated from each other and now appear on individual sheets.

In paragraph 5 of the pending Office Action the Examiner objected to the specification, noting several typographical errors. The following changes to the specification have been made to correct these errors:

at page 15, line 18, the phrase --block 3402-- has been replaced with -- block 3404--; and

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at page 37, line 14, the phrase --43202-- has been replaced with
--4302--.

Applicant respectfully submits that incorporation of the amendments to the specification and Figures, as described, overcome the Examiner's objections.

Rejection based on Double Patenting

In paragraphs 8-10 of the pending Office Action the Examiner rejected Claims 1,2, 3, 4, 6, 7, and 8-13 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over U.S. Patent No. 6,573,986 to Smith ("Smith"). As noted by the Examiner, this rejection can be overcome with the filing of a terminal disclaimer if the conflicting patent is commonly owned with the pending application. The '986 patent to Smith is assigned to the Assignee of the pending application.

Applicant submits the accompanying "Terminal Disclaimer" under 37 C.F.R. § 1.130(b) that disclaims the terminal part of the statutory term of any patent granted on the instant application which extends beyond the expiration date of the full statutory term of prior patent No. 6,573,986 as the term of the prior patent is defined in 35 U.S.C. §§154 and 173. Thus, Applicant respectfully submits that the Examiner's double patenting rejections are moot and that Claims 1, 2, 3, 4, 6, 7, and 8-13 are in condition for allowance.

Rejection of Claims 1-8 Under 35 U.S.C. § 102(b)

In paragraph 12 of the pending Office Action, the Examiner rejected Claims 1-8 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Number 6,061,119 to Ota ("Ota"). In rejecting Claims 1-8, the Examiner asserted that Ota disclosed all

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the limitations recited in Claims 1-8. Applicant respectfully submits that Ota does not describe all of the limitations of Claims 1-8.

Ota describes a method for measurement of the distortion of a projection optical system using techniques referred to as "reference wafer" techniques where "a reference wafer is employed for measurement." (Ota Col. 1, lines 21-22). Ota describes that in conventional techniques "the reference wafer would expand or contract as temperature changes." (Ota Col.1, lines 32-33). Ota states "it is an object of the present invention to provide a method of measuring distortion of a projection lens which can effect measurement without being influenced by the atmospheric temperature at the time of coordinate measurement." (Ota Col. 1, lines 45-49).

Ota describes techniques where a reference wafer W10, with a reference pattern called a main measure pattern, is installed in the exposure apparatus to be measured, where a second pattern (a "sub-measure" pattern) is exposed onto the reference wafer. Ota then measures relative deviation between the reference pattern and the second pattern, thereby indicating distortion of the projection lens. See Ota at Column 4, line 62 through column 5, line 17, and Figures 1 and 8. Unlike Ota, Claim 1 does not use a reference wafer, and the same reticle pattern is exposed in both a first and second position. For example, Claim 1 as amended recites:

producing an exposure of a reticle pattern on a substrate with a recording media in a first position, wherein the reticle pattern includes at least one array of alignment attributes;

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producing an exposure of the reticle pattern on the substrate in a second position, wherein the exposure of the reticle pattern in the second position is shifted in a desired direction by a desired amount, wherein an alignment attribute exposed during the first exposure and an alignment attribute exposed during the second exposure form a completed alignment attribute;

measuring positional offsets of the alignment attributes in the completed alignment attribute; and

determining a lens distortion map from the resulting positional offsets.

In contrast to Ota that uses a reference wafer, Claim 1 recites using a simple "substrate with a recording media" with no need that a reference pattern be previously applied to the wafer. In another contract to Ota, Claim 1 recites "producing an exposure of a reticle pattern on a substrate with a recording media in a first position" and "producing an exposure of the reticle pattern on the substrate in a second position." Thus, unlike Ota, Claim 1 recites that a reference wafer is not needed and the same pattern is used during both exposures.

Furthermore, the limitation of Claim 1 wherein the second position exposure is "shifted in a desired direction" would be detrimental to Ota because, for Ota, any offset between the reference wafer pattern and the second pattern exposed by the exposure apparatus would be considered an error induced by temperature variation.

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Thus, Ota does not disclose all of the limitations recited in Claim 1 and therefore Claim 1 is patentable over Ota. In addition, Claims 2-8 depend, either directly or indirectly, from Claim 1 and are also patentable over Ota.

Rejection of Claims 1-8, 14-18, 45, 46, 49, and 50 Under 35 U.S.C. § 102(a)

In paragraph 13 of the pending Office Action, the Examiner rejected Claims 1-8, 14-18, 45, 46, 49, and 50 Under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent Number 6,633,390 to Shiode et al., ("Shiode").

In rejecting Claims 1-8, 14-18, 45, 46, 49, and 50, the Examiner did not specifically address all of the limitations of the rejected claims, but instead based the rejection on the assertion that "Shiode in a focus measurement system discloses the following: projecting with a circular (curved) field and exposing reticle pattern using the curved field (Fig. 15); exposing the reticle in a first and second position wherein an alignment attribute during the first and second exposure form a completed box in box wafer mark attribute (Figs. 6, 7a, 7b, 8a, 8b, 14, 16); measuring positional offsets and determining a distortion map with position determined in the x and y direction (Figs. 12a, 12b, 13a, 13b, 17, col. 23, lines 35-40; col. 25, lines 1-15); with wafer alignment mark measurement system (col. 5, lines 15-20); an x and y tilt Zernike and higher order Zernike polynomials are determined (col. 18, lines 55-67; col. 19, lines 1-50)."

Applicant respectfully submits that the rejection in the Office Action fails to list all of the limitations of any one of the rejected claims and therefore the Section 102(a) rejection is not supported. Notwithstanding the flawed section 102 rejection,

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Applicant asserts that consideration of Shiode on the merits shows that the rejected claims are not anticipated.

Shiode describes techniques "by which focus information can be measured conveniently and very precisely." (Shiode Col. 2, lines 25-26). Shiode describes techniques where a first pattern, or mark, is exposed onto a wafer and then a second pattern or mark is exposed so that the two marks are superposed with each other. For example, Shiode describes that "Fig. 2 illustrates rectangular marks 9a and 9b of different sizes which are formed" on a reticle (Shiode Col. 5, lines 29-34). Shiode describes that "using aperture stop 4a, marks 9a and 9b are photoprinted on a dummy wafer." Then "in order that a latent image of mark 9a printed on the wafer and the projected image of the mark 9b, or alternatively, the projected image of the mark 9a and the latent image of mark 9b are superposed with each other . . . the aperture stop is changed to the aperture stop 4b and an exposure process is made." (Shiode Col. 5, lines 47-57). Thus, the two exposures described by Shiode are of different patterns, a first with both marks 9a and 9b, and a second with only mark 9a or 9b.

Claims 1-8, and 14-16

Claim 1 is independent and claims 2-8 and 14-16 dependent, either directly or indirectly, from Claim 1. As noted, Shiode describes techniques where there are two exposures, each of different patterns. This is in contrast to Claim 1, which recites "producing an exposure of a reticle pattern on a substrate with a recording media in a first position" and "producing an exposure of the reticle pattern on the substrate in

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a second position." Thus, unlike Shiode, Claim 1 recites the same pattern is used during both exposures.

The Examiner asserted that "projecting with a circular (curved) field and exposing reticle pattern using the curved field (Fig. 15)" is disclosed by Shiode. The phrase "curved field" is not used by Shiode. Figure 15 in Shiode illustrates "the difference in tilt of portions of symmetrical wavefronts." (Shiode Col. 18, lines 11-15). Thus, if the phrase "curved field" was used in the context of the Shiode patent, it would be understood by one of ordinary skill in the art at the time of Shiode's invention to refer to focus or field curvature where off-axis images lie on a curved plane due to astigmatism in a lens system. In contrast, pending Claim 14 recites that "the reticle pattern is a curved field." The "curved field" of Claim 14 is described in the application as created by utilizing only a "curved portion" of the reticle to produce an exposure. (See Figures 37 and 38 and the specification page 35 line 15 through page 36 line 7). Shiode has nothing to do with a curved field reticle pattern. Thus, Claim 14 is not anticipated.

In addition, the Examiner stated that Shiode describes that "an x and y tilt Zernike and higher order Zernike polynomials are determined (col. 18, lines 55-67; col. 19, lines 1-50). Pending Claim 15 recites that "an x-tilt and y-tilt Zernike coefficients of the projection system are determined." In contrast, Shiode describes Zernike polynomials for "angles with respect to the pupil." (Shiode Col. 19, lines 4-5). Also, Shiode describes that "detected coefficients" can be used so that "the astigmatism measurements can be done more exactly." (Shiode col. 19, lines 44-

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47). This is in contrast to Claim 15 where a lens distortion map is determined.

Shiode's system cannot produce a lens distortion map.

Applicant respectfully submits that Shiode does not disclose all of the limitations recited in Claim 1 and that Claim 1 is patentable over Shiode. Claims 2-8 and 14-16 are also patentable over Shiode for the additional reasons stated above and that Claims 2-8 and 14-16 depend, either directly or indirectly, from Claim 1.

Claims 45, 46, 49, and 50

Claim 45 is independent and Claims 46, 49, and 50 dependent, either directly or indirectly, from Claim 45. Claim 45 recites "producing an exposure of a curved field reticle pattern on a substrate with a recording media in a first position" and "producing an exposure of the curved field reticle pattern on the substrate in a second position." Thus, unlike Shiode, Claim 45 recites the same pattern is used during both exposures. In addition, as noted above in the discussion of Claim 14, Shiode does not use the phrase "curved field" but one of ordinary skill in the art at the time of Shiode's invention would understand Shiode to refer to focus or field curvature where off-axis images lie on a curved plane due to astigmatism in a lens system. In contrast, the curved field of Claim 45 is created by utilizing only a "curved portion" of the reticle to produce an exposure. (See Figures 37 and 38 and the specification page 35 line 15 through page 35 line 7).

Applicant respectfully submits that Shiode does not disclose all of the limitations recited in Claim 45 and that Claim 45 is patentable over Shiode. In addition, Claims 46, 49, and 50 depend, either directly or indirectly, from Claim 45, and are also patentable over Shiode.

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Thus, Claims 1-8, 14-18, 45, 46, 49, and 50 are patentable over Shiode and are in condition for allowance.

Rejection of Claims Under 35 U.S.C. § 103

Claims 9-13

In paragraph 15 of the pending Office Action, the Examiner rejected Claims 9-13 under 35 U.S.C. § 103 (a) as being unpatentable over Ota in view of Applicant's disclosure of prior art. In the rejection the Examiner stated that Ota disclosed all of the limitations of Claim 7 and that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the alignment attributes comprise any of the following alignment attributes: box in box, frame in frame (Fig.14) gratings, vernier pairs, Van Der Pauw resistors, capacitor structures (page 14 lines 5-12)."

Applicant respectfully submits that neither Ota nor the disclosed prior art, either individually or in combination, disclose all of the limitations of Claim 7. As discussed above, Ota does not describe all of the limitations of Claim 1, from which Claim 7 depends, and the addition of the prior art does not overcome these deficiencies. The cited art still would not recite that the same pattern is used during both exposures. In addition, the limitation of Claim 7 of shifting the reticle pattern between the first and second exposure would be detrimental to Ota because Ota would interpret any offset between the reference wafer pattern and the pattern exposed by the exposure apparatus would be considered due to temperature variation.

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The addition of the disclosed prior art does not overcome these deficiencies of Ota. The use of different types of alignment attributes by Ota would not produce the same pattern during both exposures. In addition, use of different attributes by Ota would not overcome the detrimental effect that shifting the reticle pattern between the first and second exposure would do to Ota because Ota would still interpret any offset between the reference wafer pattern and the pattern exposed by the exposure apparatus to be due to temperature variation.

Applicant respectfully submits that Claims 9-13 are patentable over the Ota and the Applicant's disclosure of prior art, both individually or in combination. Thus, Claims 9-13 are in condition for allowance.

Claims 9-13, 47, 48, 51-53

In paragraph 16 of the pending Office Action the Examiner rejected Claims 9-13, 47, 48, and 51-53 under 35 U.S.C. § 103(a) as being unpatentable over Shiode in view of Applicant's disclosure of prior art.

In rejecting Claims 9-13 the Examiner stated that Shiode disclosed all of the limitations of Claim 7 and that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the alignment attributes comprise any of the following alignment attributes: box in box, frame in frame (Fig.14) gratings, vernier pairs, Van Der Pauw resistors, capacitor structures (page 14 lines 5-12)."

As noted above, neither Shiode nor the disclosed prior art, either individually or in combination, disclose all of the limitations of Claim 7. The cited art does not make up for these deficiencies.

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The Examiner did not explain the rejection for Claims 47, 48, and 51-53 in terms of the cited art. Claims 47, 48, and 51-53 depend from Claim 45. As noted above, Claim 45 is patentable over Shiode and the addition of the disclosed prior art does not overcome the deficiencies of Shiode. The use of different types of alignment attributes by Shiode would not produce the same pattern during both exposures.

Applicant respectfully submits that Claims 9-13, 47, 48, and 51-53 are patentable over the Shiode and the Applicant's disclosure of prior art, both individually or in combination. Thus, Claims 9-13, 47, 48, and 51-53 are in condition for allowance.

Conclusion

Applicant respectfully submits that all the pending claims in the application, Claim 1-18, and 45-53, are in condition for allowance. Reconsideration and further examination of the application are requested. A Notice of Allowance is solicited.

Respectfully submitted,
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